

AMENDMENT TO THE CLAIMS:

Please cancel Claims 1-4, 10-19 and 21-22.

Please amend Claims 5-9, 20 and 23-33 as shown in the Claims in the Application appended hereto.

The amendment to the claims changes the dependency to claims that have been held allowable. Claim 20 has been amended to incorporate the limitations of intervening Claims 17-19.

Claims in the Application

S.N. 10/090,808

Filed 03/06/2002

For: METHOD AND APPARATUS FOR REMOTE DELIVERY AND
MANIPULATION OF A MINIATURE TOOL ADJACENT A WORK PIECE IN A
RESTRICTED SPACE

By: Christopher H. Sale
Daniel R. Kaltenbaugh

Attorney Docket No. S-94,529

WHAT IS CLAIMED IS:

Claim 1. (cancelled) An apparatus for remote delivery and manipulation of a miniature tool adjacent a work piece in a restricted space, comprising:

- a) a tool carrier;
- b) a carriage for manipulating said tool carrier relative to a work piece; and
- c) a remote actuator for operating said carriage.

Claim 2. (cancelled) The apparatus of Claim 1, further

comprising:

- a) means for delivery of said tool carrier in a restricted space.

Claim 3. (cancelled) The apparatus of Claim 1, further comprising:

- a) a track member operably connected to said carriage; and
- b) said remote actuator comprising a hydraulic actuator.

Claim 4. (cancelled) The apparatus of Claim 3, further comprising:

- a) a plurality of said track members operably connected to said carriage; and
- b) said track members being movable relative to said carriage.

Claim 5. (currently amended) The ~~apparatus~~ method of Claim [[4]] 34, wherein:

- a) one of said track members is movable independent of the other track members.

Claim 6. (currently amended) The ~~apparatus~~ method of Claim [[4]] 34, wherein:

- a) said hydraulic actuator comprises a plurality of actuator pistons; and
- b) each of said track members is independently operated by a respective carriage piston.

Claim 7. (currently amended) The ~~apparatus~~ method of Claim 6, wherein:

- a) a displacement of a carriage piston is substantially similar to a displacement of a corresponding actuator piston.

Claim 8. (currently amended) The ~~apparatus~~ method of Claim 7, further comprising:

- a) means for synchronizing a displacement of a carriage piston with a displacement of a corresponding actuator piston.

Claim 9. (currently amended) The ~~apparatus~~ method of Claim 8, further comprising:

- a) hydraulic lines for connecting said actuator pistons with said carriage pistons; and
- b) means for pressurizing said hydraulic lines.

Claim 10. (cancelled) The apparatus of Claim 1, further comprising:

- a) a secondary actuator for operating said remote actuator.

Claim 11. (cancelled) The apparatus of Claim 10, wherein:

- a) said secondary actuator is positioned remote from said remote actuator.

Claim 12. (cancelled) The apparatus of Claim 11, further comprising:

- a) means for detecting the position of the miniature tool relative to a work piece.

Claim 13. (cancelled) The apparatus of Claim 12, wherein:

- a) the miniature tool comprises an ultrasonic testing probe; and
- b) said position detecting means comprises an encoder operably connected to said remote actuator.

Claim 14. (cancelled) The apparatus of Claim 13, further comprising:

- a) imaging means for displaying information about the work piece.

Claim 15. (cancelled) The apparatus of Claim 1, wherein:

- a) the miniature tool comprises an ultrasonic testing probe.

Claim 16. (cancelled) An apparatus for remote delivery and manipulation of a miniature tool adjacent a work piece in a restricted space, comprising:

- a) a tool carrier;
- b) carriage means for manipulating said tool carrier relative to a work piece;
- c) a hydraulic actuator for operating said carriage means; and

- d) means for delivery of said tool carrier in a restricted space.

Claim 17. (cancelled) The apparatus of Claim 16, further comprising:

- a) first means for moving said tool carrier in a circumferential direction of the work piece.

Claim 18. (cancelled) The apparatus of Claim 17, wherein:

- a) said first means comprises a track member operably connected to said carriage means and being movable relative thereto.

Claim 19. (cancelled) The apparatus of Claim 16, further comprising:

- a) second means for rotating said tool carrier relative to the work piece.

Claim 20. (currently amended) The ~~apparatus~~ method of Claim ~~[[19]]~~ 34, ~~wherein~~ further comprising:

- a) first means for moving said tool carrier in a circumferential direction of the work piece, said first means comprising a track member operably

connected to said carriage assembly and movable relative thereto; and

- b) second means for rotating said tool carrier relative to the work piece, a) said second means ~~comprises~~ comprising a plurality of track members operably connected to said carriage ~~means~~ assembly; and b) each ~~said~~ track member ~~is~~ independently movable relative to said carriage ~~means~~ assembly.

Claim 21. (cancelled) The apparatus of Claim 20, further comprising:

- a) third means for moving said tool carrier axially along the work piece.

Claim 22. (cancelled) The apparatus of Claim 21, wherein:

- a) said third means comprises said tool carrier delivery means.

Claim 23. (currently amended) The ~~apparatus~~ method of Claim 16, wherein:

- a) said carriage ~~means~~ assembly comprises a plurality of movable track members; and

- b) said carriage ~~means~~ assembly comprises a piston for moving one of said track members.

Claim 24. (currently amended) The ~~apparatus~~ method of Claim 23, wherein:

- a) said carriage ~~means~~ assembly comprises a plurality of first pistons each for moving a corresponding track member.

Claim 25. (currently amended) The ~~apparatus~~ method of Claim 24, wherein:

- a) said hydraulic actuator comprises a plurality of second pistons corresponding to said first pistons.

Claim 26. (currently amended) The ~~apparatus~~ method of Claim 25, further comprising:

- a) means for synchronizing a displacement of one of said first pistons with a displacement of a corresponding second piston.

Claim 27. (currently amended) The ~~apparatus~~ method of Claim 26, further comprising:

- a) hydraulic lines for connecting said first and second pistons; and
- b) means for pressurizing said hydraulic lines.

Claim 28. (currently amended) The ~~apparatus~~ method of Claim 25, wherein:

- a) said first and second pistons comprise double acting pistons.

Claim 29. (currently amended) The ~~apparatus~~ method of Claim [[16]] 34, further comprising:

- a) a secondary actuator for operating said hydraulic actuator.

Claim 30. (currently amended) The ~~apparatus~~ method of Claim 29, wherein:

- a) said secondary actuator is positioned remote from said hydraulic actuator.

Claim 31. (currently amended) The ~~apparatus~~ method of Claim 30, further comprising:

- a) means for detecting the position of the miniature tool relative to a work piece.

Claim 32. (currently amended) The ~~apparatus~~ method of Claim 31, wherein:

- a) the miniature tool comprises an ultrasonic testing probe; and
- b) said position detecting means comprises an encoder operably connected to said hydraulic actuator.

Claim 33. (currently amended) The ~~apparatus~~ method of Claim 32, further comprising:

- a) imaging means for displaying information about the work piece.

Claim 34. (original) A method of remote delivery and manipulation of a miniature tool adjacent a work piece in a restricted space, comprising the steps of:

- a) providing a manipulator apparatus, comprising:
 - i) a tool carrier;
 - ii) a carriage assembly for manipulating the tool carrier relative to a work piece, the

carriage assembly including first and second movable track members;

iii) the carriage assembly including first and second pistons for operating the first and second track members, respectively; and

iv) a remote hydraulic actuator for operating the carriage assembly;

b) delivering the manipulator apparatus by a conveyor and positioning adjacent a desired area of the work piece; and

c) operating the carriage assembly by actuating the remote hydraulic actuator thereby causing one or both track members to move relative to the work piece.

Claim 35. (original) The method of Claim 34, wherein:

the step c) comprises moving the first and second track members substantially simultaneously to thereby cause the tool carrier to move along a single direction relative to the work piece.

Claim 36. (original) The method of Claim 34, wherein:

the step c) comprises moving only one of the first and second track members to thereby cause the tool carrier to rotate relative to the work piece.